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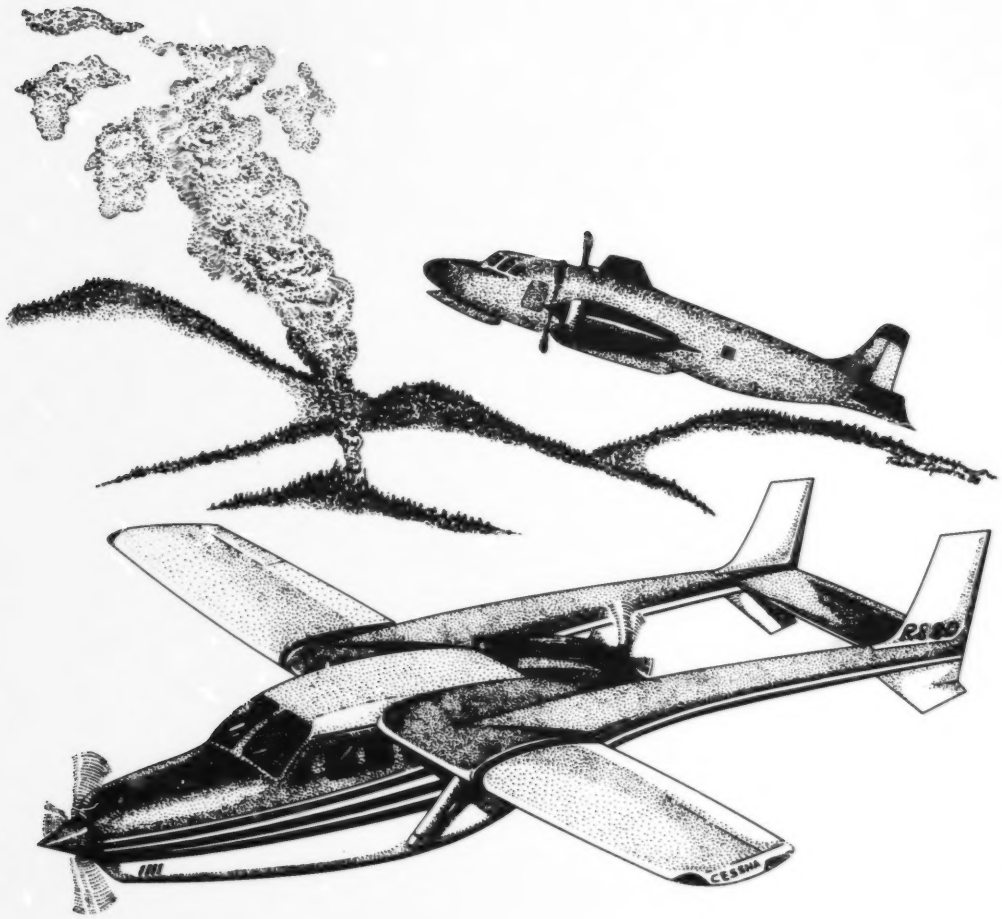
The role of bird dog officers in aerial fire suppression

W.G. Murray

Information Report PI-X-82
Petawawa National Forestry Institute



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THE ROLE OF BIRD DOG OFFICERS IN AERIAL FIRE SUPPRESSION

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ABSTRACT

A select number of Aerial Fire Operations Supervisors and Bird Dog Officers from Canadian Forest Fire Protection agencies were interviewed to identify operational procedures and the role of the Bird Dog Officer in aerial forest fire suppression. The present analysis deals with Bird Dog aircraft, communications, operational procedures, and the job qualifications of a Bird Dog Officer.

RÉSUMÉ

On a interviewé un certain nombre de responsables des opérations aériennes et d'aéropointeurs d'organismes canadiens de protection contre les incendies de forêt en vue de déterminer les méthodes opérationnelles employées et le rôle de l'aéropointeur dans l'extinction aérienne des incendies de forêt. Dans l'analyse présentée dans ce rapport, on se penche sur l'aéronef d'aéropointage, les communications, les méthodes opérationnelles et les qualités requises pour un emploi d'aéropointeur.

THE ROLE OF BIRD DOG OFFICERS IN AERIAL SUPPRESSION

INTRODUCTION

Forest fire suppression agencies across Canada have determined that the use of airtankers is an effective method of combating forest fires. However, airtankers are an expensive suppression tool and operate for the most part under less than ideal flying conditions.

In order to minimize the risks and expense, and to maximize airtanker efficiency, the majority of those fire suppresion agencies which utilize airtankers in their fire suppression program also employ Bird Dog Officers (BDOs)[1]. The primary responsibility of the BDO is to ensure that the aerial portion of the fire suppression operation is carried out in a safe, effective, and efficient manner.

One province that was using CL-215 airtankers extensively throughout their protection area without a single BDO was Manitoba. In this case, each tanker crew acted as its own BDO and was held accountable for its actions. This practice may have made sense from an economic point of view. The question was whether the addition of BDOs would improve tanker operations, thus warranting the added cost of BDOs and light Bird Dog aircraft. The answer could only be arrived at by undertaking a study of the use of BDOs elsewhere in Canada and determining the impact of their use in Manitoba. The Canadian Forestry Service undertook this study under Project #CM-6.4 of the Manitoba Federal/Provincial Agreement.

METHOD

A questionnaire (Appendix I) was prepared and some Aerial Fire Operations Supervisors and BDOs from Canadian protection agencies were interviewed. Collaborating documentation was collected and compiled. The information covered all aspects of BDO operations including the types of aircraft used for this purpose.

Bird Dog aircraft and pilots

Current Bird Dog aircraft (Bd)[2] include the Beechcraft Baron, Cessna models 206, 310, and 337, and the Piper Aerostar and Aztec. Other aircraft that may be pressed into service include Cessna 210s, Piper Commanches, and Turbo Beavers. The basic reasons for using these particular types of Bd aircraft are: good visibility, serviceability, safety, and speed. Other characteristics that have been identified as necessary by BDOs for Bd aircraft were reliability, manoeuverability, comfort, and fuel capacity. One

[1]Terminology differs from agency to agency. BDOs are also known as Aerial Attack Leaders or Aerial Attack Officers.

[2]An aircraft carrying the person-in-charge of Air Attack Operations over a fire. Also referred to as Bird dog.

Protection Agency also gave importance to cargo delivery capability. These aircraft qualities are not listed in order of priority because BDOs differed when establishing priorities.

Suppression agencies pointed out that it was beneficial if the Bd flew faster than or at least as fast as the airtanker group with which it was working. The rationale was that the suppression operation will be more efficient and economical if the BDO arrives over the fire in advance of the airtanker group, assesses the fire situation, formulates an attack plan, and is ready to commence aerial suppression upon arrival of the first airtanker.

Two suppression agencies supplied their own Bds, whereas all the other agencies contracted the Bd, complete with pilots. In one case the agency-owned Bds were flown by provincially employed pilots but, in the other, they were flown by contract pilots. Contracts for the provision of Bds and pilots run for the projected fire season. Each agency contracts for a specific time frame. Contracts commence approximately May 1 and terminate anywhere from August 31 (Ont.) to mid-October (B.C.), depending on geographical location. Agencies have the option to have Bird Dogs and pilots available on a pre- or post-season basis if the need arises. Multi-year contracts ranging in duration for up to five years (fire seasons) were negotiated and contained a clause which guaranteed payment for a specified minimum number of hours per season. The minimum was two to three hundred hours. During seasons of low fire incidence the anticipated unused portion of the specified minimum hours were utilized by assigning the aircraft and pilots to other flight duties.

A standard penalty clause in all contracts, ie. availability, was included to ensure that Bds were always available at short notice. When the airtankers and Bds were operated by the same contractor, engineers and service personnel were more readily available. This resulted in a reduction of down time and enhancement of the availability of backup aircraft. Unserviceability of aircraft was not identified as a problem for any agency. The suppression agencies stressed that the provision of reliable services is a reflection of the reliability of the contractor and the price paid for the services they were providing. Cheapest was not the best in this field. Familiarization flights at the beginning of each fire season enabled the BDO and the Bd pilot to develop a team relationship. Another standard contractual specification was that Bd pilots could be replaced at the discretion of the BDO; however, pilot replacement/discipline was not a common problem.

Operational restrictions for Bd pilots varied from agency to agency; two agencies stated they did not impose any restrictions while the others identified restrictions such as,

(a) 12 hours duty time with a maximum of eight hours flight time,
(b) 14 hours duty time with a maximum of nine hours flight time,
(c) worked according to Transport Canada regulations,
(d) worked according to company standards.

The BDO was the final authority irrespective of standards to determine whether the Bd pilot was capable of further flight. The need to exceed allowable daily duty hours seldom occurred.

The hiring agencies usually supplied the fuel and oil for the Bd aircraft, but serviceability and airworthiness was the responsibility of the contractor.

Basing and relocation of Bd aircraft was specified by the agencies as dictated by the fire hazard. To compensate for this need to relocate, the agencies were usually responsible for crew expenses. Sometimes the contractor was responsible for all expenses. Where provincial pilots were concerned, they received expenses only when operating away from the home base. The contracting agencies picked up the tab only when their pilots moved from designated bases, but by redesignation of home bases the agency could circumvent this expense.

The Bird Dog Officers

The primary responsibility of the BDO was to ensure that aerial suppression operations were carried out in a safe and efficient manner in accordance with the contracting agency's policy and recognized fire control practices.

The aerial fire operations supervisors and BDOs that were interviewed stated that a candidate for a BDO position should have (a) proven fire suppression/control capabilities, (b) a knowledge of fuel complexes and their impact on fire behaviour, (c) an understanding of fire weather and its impact on combustion, and (d) a basic understanding of the Provincial fire suppression and operating plans and procedures.

Below is a composite of all BDO job descriptions supplied by the agencies. Emphasis on individual requirements vary but the ingredients are essentially as presented.

General qualifications

1. Education

   - secondary school or equivalent, or
   - forest technical school or equivalent, or
   - successful completion of an air attack training course.

2. Skills

   - a proven ability to manage all aspects of fire suppression operations,
   - a demonstrated ability to organize, analyze, plan, and supervise,
   - a capability to perform under pressure,
   - an ability to withstand long hours of flying under adverse conditions,
   - an ability to relay clear concise verbal instructions and to prepare clear and concise written reports,
   - an ability to instill confidence via actions and words,
   - an ability to be assertive and at the same time diplomatic.

3. Experience

   - must have the knowledge and ability normally associated with several years of forest service field experience and proven achievements in all phases of fire suppression activities.

Essential qualifications

1. Knowledge of

- airtanker capabilities and limitations,
- fire retardants/suppressants, their makeup, and capabilities
- provincial fire control objectives and concepts,
- fire behaviour and influencing parameters,
- fire weather parameters and their impact on fire behaviour,
- applicable air regulations,
- fire management techniques and objectives,

The BDO must also be able to determine and assess values at risk and have the ability to determine cost effectiveness of suppression activities. He or she must understand agency training and planning policies and procedures.

2. Ability

- to communicate clearly and concisely both orally and in writing,
- to plan, organize, and supervise all aspects of fire suppression activities, and
- to teach.

3. Personal characteristics

- self confidence
- ability to analyze complex situations and make rational decisions,
- have a positive attitude,
- possess a high degree of initiative and an ability to function in high stress situations, and
- must be physically fit with proven immunity to motion sickness.

Desirable qualifications

- individual must be mature, be able to work cooperatively, show strong leadership abilities, possess the ability to instill confidence, and have the knack to maintain the team approach irrespective of the task.

Bird Dog Officer job description

Under the direction of the aerial fire operations supervisor, the Bird Dog Officer directs and supervises aerial attack operations on forest fires and assists in the management and administration of all aspects of the aerial fire suppression program. He prepares and conducts training programs regarding fire suppression techniques and safety.

The primary function of the BDO is to supervise and direct aerial attack on forest fires by:

- compiling information concerning the request for aerial action;
- initiating action for speedy departure to a new fire;
- operating as aerial coordinator for the fire while working from a Bd aircraft;
- analyzing the fire situation;

- recognizing fire and fuel characteristics;
- predicting the fire's potential for spread;
- developing and initiating an aerial attack plan to meet fire control objectives;
- determining air tanker requirements (numbers), drop requirements (salvo, trail, single door, door combinations, time delay requirements between doors);
- identifying load placement, and determining load effectiveness;
- communicating action plan to Bird Dog and airtanker pilots.

Another essential duty is the preparation and the conduct of training programs related to aerial fire suppression and safety, and this is executed by:

- analyzing fire protection training requirements;
- assisting in the preparation of fire training programs;
- recommending revisions to fire training manuals;
- developing training aids and simulations for fire exercises;
- preparing and delivering lectures and demonstrating procedures in the classroom and during field exercises.

Bird Dog Officer certification and assessment

The type and depth of training varies vastly among agencies; consequently their certification standards vary. Whether or not Canada-wide proficiency standards have been established or are in use was not determined. Because agencies exchange air tanker groups during heavy fire loads, it may be beneficial to have a national standard for BDOs.

The sample Air Operations air attack evaluation form (Table 1), together with the description of the rated terms, the rating scale, and the grade indicators are those followed by the British Columbia Ministry of Forests. This is an example of a comprehensive rating of a BDO's performance. The check or rating rides are carried out by the Air Coordinator or his designate on actual suppression missions directed by the BDO undergoing appraisal. A description of the rated factors indicates the depth of the evaluation probe:

A. Preparedness

- Weather, danger class, fire activity, airtanker alerts (Regional and Provincial), aircraft serviceability, personnel, and equipment availability.

B. Navigation

- Enroute grid referencing, accurate E.T.A. at fire, identification of reload base, and determination of reload turnaround time to fire from that base.

TABLE 1.

AIR OPERATIONS
AIR ATTACK EVALUATION

EMPLOYEE NAME	RATERS NAME	AIR OPS CENTRE
EXPERIENCE (total targets to date)	CURRENCY (targets this season)	DATE 198

FIRE SIZE	CHARACTER + DIFFICULTY (smouldering, candeling, crowning, spotting)	EXPOSURE

RATE OF SPREAD (slow, medium, fast)	SLOPE %	FUEL TYPE	OTHER

	RATING	COMMENTS
A. PREPAREDNESS		
B. NAVIGATION		
C. COMMUNICATIONS		
D. STRATEGY 1. Initial fire assessment		
2. Recognize potential		
3. Identifies values		
4. Attack plan		
5. Stop action		
6. Correct use of A/C		
E. TARGET DESCRIPTION AND INSTRUCTIONS		
F. ASSESSMENTS		
G. SAFETY		
H. DEBRIEFING		
I. LEADERSHIP		
J. SUITABILITY		

(OVERALL PERFORMANCE, CORRECTIVE ACTION, ETC.)

RATER'S COMMENTS: _____

_____

_____

_____

EMPLOYEE'S COMMENTS: _____

_____

_____

_____

RATER _____ DATE _____ EMPLOYEE _____ DATE _____

PROTECTION OFFICER _____ DATE _____

C. Communications

- Communications system operation, presentation of position reports, contact with Regional and District Duty Officer and ground crews, C.A.D.I.Z.[3], contact with other aircraft.

D. Strategy

- Initial fire assessment;
- Recognize potential of fire considering fire danger, current and predicted weather, topography, fuels, and ground crew delays (recognized from relayed information or first visual contact);
- Identification of values at risk, ie. those concerning life, public and private improvements, timber, ecology, and political implications;
- Attack plan: objective properly defined, implementation and execution of said objective, and level of understanding of planned action in concert with the ground crews;
- All stop action decisions: reasons for termination, timing, and tardiness in reaching a decision;
- Correct use of airtankers: selection of type of alternatives available, drop capabilities of each airtanker, instructions to pilot, and drop sequence selection.

E. Target description and instructions

- Instructions and advice to pilots concerning initial target orientation and its elevation, attack plan, accurate run description (ie. approach circuit, selection and use of reference points), hazards, drop type and placement, airtanker height, speed, and door opening intervals, wind correction, exit path, and destination instructions following completion of drop. (The emphasis should be whether the foregoing instructions were clear, concise, understood, and confirmed).

F. Assessments

- Air speed, height, line, accuracy, retardant.

G. Safety

- Hazard identification: hazards enroute, over the target, and on return to any base; observe tankers during and after drop, report abnormalities such as doors not closed, streaming, etc.; and proper use of 'impending drop' warning device and issuance of all clear signal for ground personnel.

H. Debriefing

- presentation of information, identification of problems, development of solutions, and documentation of the sortie.

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[3]Canadian Air Defence Identification Zone

I. Leadership

- Demonstrates leadership, tact, and judgment, instills confidence and has the respect of the air and ground personnel involved in fire control.

J. Personal suitability

- Confident, analytical, decisive, displays positive attitude, physically fit, not prone to motion sickness, or exhibit nervousness.

Each of the activities on the rating sheet are graded in accordance with the following guide using a 0 to 4 range. These ratings represent:

0. No errors made, demonstrated thorough knowledge of this function. Demonstrated excellent leadership skills and suitability;

1. Minor errors made, objectives achieved in an efficient, professional manner, anticipated and adapted to changing or unusual circumstances. Demonstrated good leadership skills and suitability;

2. Frequent minor errors made; however, did not affect achievement of objective and met minimum requirements. Possessed adequate leadership skills and suitability;

3. Errors or omissions were made requiring considerable input from other personnel, aerial attack objective was achieved with some difficulty but the operation was conducted in a non-professional manner and performance was unsatisfactory;

4. A combination of errors or omissions were committed and aerial attack objective was not achieved; safety was compromised. Performance was unacceptable.

Based on these ratings an overall grade is assigned.

Grade indicators are:

0 - Excellent performance;
1 - Good performance;
2 - Adequate performance, however, requires immediate corrective action;
3 - Unsatisfactory, will result in conditional certification, or immediate decertification if previous ratings were no better than 3;
4 - A rating of 4 indicates an individual is incapable of carrying out the function and results in immediate decertification pending further training and reassessment.

At the commencement of each new season it is essential that all air attack officers be subjected to a brief refresher to maintain their proficiency. This takes the form of:

(1) a written examination relative to the job functions;
(2) an orientation and familiarization flight with new pilots to develop routines;
(3) an evaluation ride with the air coordinator.

This refresher exercise should be completed as early as possible so that reports and recommendations arrive at Branch Headquarters to facilitate confirmation of certification. In addition to the refresher course and prior to re-certification, all air attack officers must undergo medical certification as specified by the agency.

The salaries paid to BDOs varied from agency to agency in accordance with the designated applicable classification levels within the provincial organization.

The 1985 classification and/or salary levels were:

New Brunswick	Ranger III
Québec (SCO)	$30,000 range
Ontario	Resource Tech III
Saskatchewan	Resource Officer II
Alberta (Permanent)	Air Attack Officer FOIII
Alberta (Seasonal)	$10-15/hour
British Columbia	$980-1075 bi-weekly

New Brunswick did not have BDOs attached to the Fire Centre on a full time basis and, consequently, these individuals were only seasonally committed to aerial suppression related tasks.

Some Aerial Operations Supervisors stated that because BDO duties were much more demanding than the duties carried out by Rangers or Resource Officers, provisions should be made to provide adequate compensation when they performed as BDOs.

The view was that the salary should be in the $28-30,000 range to attract and ensure that competent personnel would be willing to act as BDOs. Compensation for hours worked over the set minimum was either monetary or in the form of compensatory time off or a combination of both depending on the employer/employee arrangement. The fire situation dictated the number of hours that had to be worked in a given season. Frequently the total was in excess of the norm established by the agency. Examples of provincial requirements and compensations received are:

1. New Brunswick: Eight hour work day with no limit on hours per day with the overtime rate at time and one half after eight hours on a given day; all living expenses assumed by the employer.

2. Québec (Société de Conservation de l'Outaouais): Eight hour work day with no daily limit, overtime compensated at time and one half after 40 hours per week. The BDO is a SCO employee, works directly out of the fire centre, and is responsible for his own living expenses.

3. Ontario: Works eight hours per day with overtime compensation after 40 hours per week in either cash or time off, but is limited to 19 days of consecutive duty.

4. Saskatchewan: Essentially an eight hour work day but actual hours on duty for any given day are determined by the hazard, with overtime at time and one half after 40 hours worked in a week. Expenses are paid by the agency only if the BDO is away from home base.

5. Alberta: The normal work day for a BDO (AFS staff or seasonal employee) is 7¾ hours with one hour compensation for lunch. Hours worked in excess of 7¾ are compensated at the rate of time and one-half for the first 2 hours and double time for all hours worked thereafter. BDOs work a continuous 20-day shift followed by eight days off. During their work period BDOs receive time and one half when working Saturdays and double time for Sundays and statutory holidays. They are reimbursed for accommodations and meals upon submission of expense accounts. Relief BDOs work the eight day shifts.

6. British Columbia: BDO normally works a seven hour day, with no daily limit but is on duty (usually at a specified base) from 10 a.m. - 6 p.m., with the daily limit under the regular pay rate set at 10 hours. If hours per day worked exceed 10 the first two hours are compensated at one and one half times the regular rate and additional hours at two times the regular rate of pay (provided a minimum of 70 hours was worked during the two week period). Saturdays, Sundays, and statutory holidays are automatic overtime days.

Bird Dog Operation

The expected fire hazard is computed daily by Provincial or Regional Headquarters and is relayed to the Duty Officers who are responsible for setting standby times and designating alerts for those air crews operating in their jurisdiction.

Standby procedures

New Brunswick's aerial suppression operation is unique in that the Province's aerial attack force is located at Dunphy Airstrip and is initially dispatched from this central base. Reloading facilities are located at satellite bases at various locations in the province. Consequently, the BDOs are always headquartered at the main base.

Standby alert codes and standby procedures adopted by agencies that were contacted are defined in the following text:

Red alert - Air crews on base ready for immediate dispatch.

Yellow alert - Air crews are expected to be in close proximity to base with take-off in:

30 minutes (British Columbia)
45 minutes (Saskatchewan)
60 minutes (Ontario)

The BDOs employed by the SCO in Québec may fly detection patrols when the hazard is yellow.

Blue alert - British Columbia signifies that air crews must be available for departure within a specified time period.

ie. Blue I - one hour takeoff
Blue II - two hour takeoff

Alberta signifies air crews may be released from the attack base for a designated period. Blue Days are usually the result of general rain and low hazard throughout the province. Such days are the exception rather than the rule and crews will be rotated to ensure that no airtanker group remains in a low hazard area over long periods while other groups work long duty days on standby.

Other standby time designations followed by the Alberta Forest Service are:

On base - Personnel must be on base between specified times of the standby period.

One hour - Personnel must be available to depart (be airborne) from their base within one hour.

Two hour - Personnel must be available to depart (be airborne) from their base within two hours.

Immediate - Immediate standby will be designated by local Forest Protection Duty Officers in which case the airtanker engines are prewarmed, the crews are at operations building, and the airtankers are loaded and ready for immediate departure along with the Bird Dog aircraft. This alert remains in effect up to a maximum of one hour unless otherwise notified.

Saskatchewan - 24 hour stand down ie. unconditional release from duty for specified period.

Ontario - if no identified air attack is anticipated for the given day, air crew location must be known at all times so that, if contacted and directed to leave, they can depart from the attack base within 4 hours.

Green alert

British Columbia: personnel may be released from standby obligations for a specified time period.

Ontario - aircraft are not required for air attack, may be assigned other roles and pilot may be given day off.

Québec - BDO may fly detection patrols during this period.

The BDO reports to the aerial fire operations supervisor and assists in day-to-day operations while at the base. However, once the BDO is airborne he or she works closely with the Fire Boss to formulate and carry out aerial

suppression activities and to keep the Fire Boss updated on fire behaviour, action taken, or termination of aerial action. Contact with the Regional Duty Officer is always maintained to enable redirection to a fire of a higher priority.

On unmanned fires the BDO initiates suppression action based purely on a personal aerial assessment of the fire. While working in a support role, the BDO specifies drop deliveries according to the Fire Boss' requests. During multi-tanker group operations in Alberta an air attack boss may be designated to delegate and maintain authority over several BDOs. In this case he is responsible to the Forest Duty Officer administratively, and to the Line or Fire Boss operationally. The authority to terminate air tanker action rests with the BDO following consultation with the Fire Boss.

Sustained bombing is not usual practice for all agencies. The common philosophy is one of an initial aerial attack followed by a rapid and aggressive attack by ground forces. The BDO in British Columbia may be asked to maintain sustained bombing action to establish control lines in areas which are inaccessible to ground crews, to protect lives, and to protect areas of very high value. However, in Alberta and Saskatchewan, BDOs attached to skimmer airtankers are frequently involved in sustained action. Termination of sustained bombing is based on a decision reached by the BDO after due consultation with the Fire Boss except when instructed to redirect the tankers elsewhere for initial attack action.

Reporting procedures

The BDO is constantly in contact with the Regional/District Fire Duty Officer (FDO) and the tanker base. Information concerning the success or failure of the mission or the request for extra resources are directed to the FDO. A decision to terminate may be overridden by the FDO if, in his opinion, circumstances dictate that aerial action be continued for reasons other than effectiveness.

Sample report forms completed by BDOs are appended.

British Columbia	Appendix II
Alberta	Appendix III
*Saskatchewan	Appendix IV
Ontario	Appendix Va, Vb
Québec (SCO)	Appendix VI
*New Brunswick	Appendix VII

Radio communications

Air to air: The BDO and Bd pilot work as a team, with the Bd pilot usually acting as the air traffic controller upon his or her arrival at the fire zone. On assuming this role, all aircraft entering the fire zone must report to the Bd pilot. Communications for final runs, drop assessments, and post-drop instructions are dealt with directly by the BDO and all other communications

*Under revision to incorporate use of foam.

are relayed to the tanker pilots through the Bd pilot. In British Columbia and Québec the BDO handles nearly all air-to-air communications.

Air to ground: The BDO maintains contact with the Fire Boss if the latter is on site in order to formulate attack plans, to keep the Fire Boss informed of impending drops, and to brief the Fire boss on the general fire situation as observed from the air.

Air to base: The BDO keeps the duty officer informed of the fire situation and provides the pertinent details involving the aerial operation. A secondary duty when working with land-based airtankers is to keep the retardant base informed of reloading needs.

The Bd aircraft and the airtankers are equipped with back-up radios, but should the back-up communication system also fail the aircraft is grounded until the problem is corrected.

The most commonly used radios are of the Wulfsberg or Motorola variety, equipped with a wide range of frequencies which conform to the Provincial Communication Network.

Operational safety

The BDO and Bd pilot work closely together in the interest of safety during aerial suppression missions. The BDO's main concern is achieving fire control in a safe but efficient manner and the Bd pilot concentrates on aircraft safety.

Hazards such as power lines, towers, tall snags, unfavourable wind patterns, high hills, and blind valleys are identified by the BDO and the Bd pilot and the BDO ensures that the airtanker pilots are aware of all existing obstacles in the suppression operation zone. The final decision regarding the safety of the airtanker during bombing runs (including approach and departure paths) is the responsibility of the air tanker pilot.

Reloading practices

British Columbia and Alberta are the only provinces where the BDO selects reloading sites for the land-based aircraft that are under his or her control.

The Saskatchewan land-based air tankers return to the base from which they were dispatched to reload, but in New Brunswick airtankers are reloaded either at the home base or at the satellite base nearest the fire.

BDOs connected with skimmer airtankers recommend appropriate bodies of water as pick-up sites but the tanker pilot makes the actual selection. The final decision always rests with the airtanker pilot where safety is concerned.

General overview

In British Columbia it is mandatory for the airtanker pilots to operate with a BD. The other agencies, other than Saskatchewan, stated that airtankers were

seldom called upon to fight fires without the guidance of a BDO. In Saskatchewan retardant airtankers never operate without a BDO, but a skimmer airtanker is often sent out as a "Lone wolf" to bomb fires and to initiate or terminate aerial suppression action as they see fit. The benefits of having a BDO call the shot (as opposed to letting airtanker pilots pick their own targets) differed from agency to agency but a common belief was that an experienced BDO in charge of aerial suppression operations ensured a safer, more efficient, and more economic operation. Safer, because the BDO and Bd pilot identify obstructions, terrain types, and smoke and wind conditions that are a hazard to the airtankers, and their warnings to ground crews of impending drops minimizes injury from flying debris. Coordination of air and ground attack efforts are best achieved by a BDO in consultation with the Fire Boss.

A more efficient and economic suppression operation is achieved because the BDO is essentially a fire behaviour specialist who has the ability to assess the fire and fuel situation and to deliver the retardant/suppressant where optimum effectiveness is achieved in controlling fire spread. Effectiveness and cost optimization went hand in hand because BDO-associated costs were minimal compared to retardant and airtanker costs. Other reasons for having BDOs in charge of airtanker groups were:

(1) prioritization of fires in the case of multiple starts,
(2) assessment of drop effectiveness and accuracy, and providing feedback to the tanker pilots to improve load placement and maintaining a continuous control line,
(3) provision of on-site field reports to the Fire Duty Officer,
(4) provision of on-site reports to the Fire Boss concerning fires behaviour, possible trouble spots, etc.,
(5) controlling aircraft traffic in the fire zone for safety reasons,
(6) maintaining records of flight times of airtankers and Bd aircraft, and
(7) recording the numbers of loads delivered by each airtanker.

CONCLUSIONS

The agencies that were interviewed stressed that the BDO was an essential link in their aerial suppression program. The negative responses to the query "How often are airtanker pilots called on to bomb fires without the guidance of the BDO?" conclusively confirmed that the BDO was considered indispensible.

The role of the BDO was that of the fire control specialist who had the ability and stamina to spend long and sometimes very uncomfortable hours in a light aircraft directing aerial fire suppression operations. The BDO had to be an individual who commanded the respect and confidence of supervisors as well as of subordinates. He or she had to be able to analyze complex situations and make correct snap decisions. The decisions made by the BDO had the potential to result in savings of expenditure of hundreds of thousands of agency dollars.

Considering the level of training and experience required to perform the BDO job properly, and the investment in equipment (airtankers) that is under the control of the BDO, remuneration for services rendered appeared inadequate for the responsibility vested in this position.

The benefits of incorporating the BDO system in conjunction with the operation of Manitoba's three CL-215s could not be quantitatively expressed without an in-depth study of their airtanker operations. The basic advantages of having a BDO would be:

(a) Upon arrival at the fire site, a BDO can expertly analyze the fire situation, identify ground and air suppression needs, and relay this information to Regional and/or District offices. This eliminates resource dispatching time delays which occur when reliance for information hinges on the arrival of the Fire Boss. The result is that initial attack is strengthened. The assessment may well result in no aerial action if fire growth will be inconsequential because of location, spread rate, and fuel conditions or, conversely, if fire behaviour and fuel and weather parameters are such that utilization of all available resources would prove ineffective at that given time of day;

(b) The elimination of a time lag between the arrival of airtankers and delivery on the target while tanker crews determine where aerial deliveries should be made. The BDO will have this sorted out and will direct the airtankers accordingly on their arrival. By flying over the fire on a continuing basis, the BDO can identify changes in burning characteristics, and can react quickly in selecting a target for the next airtanker drop;

(c) Load delivery deficiencies could be identified by the BDO and adjustments made, thereby increasing delivery efficiency;

(d) In the event of multiple fire starts in a given area, the BDO will be in a position to prioritize fires and work on them accordingly, thereby minimizing selection of the wrong target;

(e) The decision to terminate action by a BDO will be based on a knowledge of parameters affecting fire propagation. Consequently, by selective load placement, the required number of deliveries may be substantially reduced and the airtanker be available sooner for redeployment.

The inclusion of a BDO in the aerial attack system should, therefore, prove to be financially viable.

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APPENDIX I: Questionnaire for Aerial Fire Operations Supervisors and BDOs

PROVINCE/AGENCY

1. **AIRCRAFT**

TYPE USED

WHY

TYPE PREFERRED

WHY

CONTRACTED OWNED

DURATION COST

MINIMUM $ HOURS

UNAVAILABILITY DUE TO UNSERVICEABILITY OR PILOT PROBLEM

REPLACEMENT PROVISIONS

HOLD BACK ON CONTRACT

HOURS/DAY RESTRICTIONS FOR PILOT

PILOT REPLACEMENT IF ALLOWABLE HOURS EXCEEDED

REFUELING AND SERVICING PROVISIONS

BASING

PILOT EXPENSES ROOM & BOARD TRANSPORTATION

2. BIRD DOG OFFICER

QUALIFICATIONS: FIRE AVIATION (a) Experience
(b) Knowledge

(a) Experience

(b) Knowledge

ESSENTIAL

DESIRED

SALARY PAID (a) BASE PAY

(b) OVERTIME

HOURS OF WORK/DAY LIMITATIONS

BASING

ACCOMMODATION AND BOARD
(a) Compensation
(b) All Expenses Paid

3. BIRD DOG OPERATION

STAND-BY CRITERIA

REQUEST FOR ACTION

WHO INSTRUCTS BIRDDOG OFFICER?

AUTHORITY VESTED IN BDO TO INITIATE A/T ACTION WHEN FIRST ONE AT FIRE

TO INITIATE A/T ACTION WHEN INITIAL ATTACK CREW ON FIRE

TO TERMINATE A/T ACTION
INITIAL ATTACK

SUSTAINED BOMBING

REPORTING PROCEDURES)
TYPE OF INFORMATION)
) SAMPLE FORM
DEGREE OF DETAIL

RADIO CONTACT

BD TO A/T

BD TO GROUND

BD TO BASE

RADIO TYPE

PRIORITIZING FIRES

BDO AUTHORITY TO PRIORITIZE

FIRE CENTRE AUTHORITY TO RECALL OR RE-DIRECT

RESPONSIBILITY FOR A/T SAFETY
SELECT APPROACH AND DEPARTURE PATHS

IDENTIFY HAZARDS

LOCATE RELOADING SITES

LIABILITY PROVISIONS GOVERNING DECISIONS AFFECTING A/T SAFETY

JURISDICTION OVER ALL A/C IN AREA

STANDBY CRITERIA AS RELATED TO INDICES

GENERAL

HOW OFTEN ARE A/T PILOTS CALLED ON TO BOMB FIRE WITHOUT THE GUIDANCE OF THE BDO?

WHAT ARE THE BENEFITS OF HAVING A BDO CALL THE SHOT AS OPPOSED TO LETTING A/T PILOTS PICK THEIR TARGETS?

COMMENTS

Appendix II

AIR TANKER ACTION

BIRDDOG OFFICER REPORT

DATE_____

GRID_____ TARGET NO._____ BD REQUESTED _____

GEO. LOC._____ FIRE NAME_____ BD OFF _____

HEADING_____ FD FIRE NO._____ BD ETA FIRE _____

DISTANCE_____ ALERT_____ BD OVER FIRE _____

SIZE REPORTED_____ ATTACK_____ Initial ____ Support _____ BD DOWN _____

SIZE ON ATTACK_____ BURNING PERIOD_____ 1___ 2___ 3___ 4___ TARGET ELEV _____

SIZE ON COMP._____ HAZARD RATING_____ 1___ 2___ 3___ 4___ 5___ GROUND CREW _____

OTHER AIRCRAFT _____

DROP NO.	TKR. NO.	DOORS USED	TIME	ASSESS	RETARD SOURCE	QUAL.	INSTR.	DROP NO.	TKR. NO.	DOORS USED	TIME	ASSESS	RETARD SOURCE	QUAL.	INSTR.

No. of LDS	RETARDANT BASE				LITRES	RATE	COST
A26							
FC							
DC6							

A/C	HOURS	RATE	COST
A26			
FC			
DC6			
BD			

GRD COST $

MAP

REMARKS/OBJECTIVES _____

Appendix III

AIRTANKER EVALUATION DROP FORM

FORM FP63 92

[1] FIRE NUMBER — FOREST | DISTRICT | FIRE NO. | YEAR

[2] LOCATION — LSD | SEC | TWP | RANGE | MER

[3] DATE — DAY | MONTH | YEAR

TIMES (24 HOUR CLOCK)

[4] TANKER REQUESTED
[5] BIRDDOG TIME OFF
[6] 1ST TANKER TIME OFF
[7] BIRDDOG ARR. @ FIRE
[8] 1ST TANKER ARR. @ FIRE
[9] FIRST DROP
[10] LAST DROP
[11] GROUND CREW PRESENT — 1 YES | 2 NO
[12] BIRDDOG TIME DOWN

SIZE OF FIRE (ACRES)

[13] @ ARRIVAL OF BIRDDOG
[14] @ MISSION COMPLETION

[15] **TYPE OF MISSION** — INITIAL ATTACK [1] | SUPPORT [2]

[16] ORIGINATING TANKER BASE _____ [17] DISTANCE TO FIRE km
[18] DISTANCE TO WATER SOURCE FROM FIRE (WATER DROPS ONLY) km
[19] AVE. TIME BETWEEN DROPS MIN

[20] **TANKER STANDBY STATUS** — IMMEDIATE [1] | 0% BASE [2] | 1 HOUR [3] | 2 HOUR [4]

[21] FUEL TYPE [22] **TOPOGRAPHY** — LEVEL [1] | ROLLING [2] | STEEP [3]

[23] **TYPE OF RETARDANT** — FT 100 [1] | LC [2] | PHOSCHEK [3] | WATER [4] | OTHER [5]

[24] PRE ATTACK	1	2	3	4	5
FIRE BEHAVIOUR	SMOULDERING	RUNNING	CANDLING	SPOTTING	CROWNING
[25] POST ATTACK	1	2	3	4	5

[26] **MISSION SUCCESS** — YES [1] | NO [2]

[27] **IF UNSUCCESSFUL INDICATE CAUSE OF FAILURE** — WEATHER [1] | MECHANICAL [2] | FIRE UNCONTROLLABLE [3] | DIVERTED [4] | OTHER [5]

*DROP DETAILS (LONG TERM RETARDANTS ONLY)

[28] DROP NO	[29] TANKER G.P. NO	[30] DROP TIME 24 HOUR CLOCK	[31] DIRECT ATTACK FLANK	SPOT	HEAD	REAR	[32] INDIRECT ATTACK FLANK	SPOT	HEAD	REAR	[33] DROP TYPE NOZZLE DOORS	SALVO	TRAIN	[34] RETARDANT EFF. (%) 1 10 YES	NO	DROP COMMENTS

[35] COST PER GAL. RETARDANT x [36] GALS. DROPPED [37] $
[38] COST PER TANKER HOUR x [39] NO. OF TANKERS x [40] HOURS FLOWN [41] $
[42] COST PER BIRDDOG A/C HOUR x [43] HOURS FLOWN [44] $

COMMENTS

MAP

N

*USE ADDITIONAL SHEETS IF NECESSARY

[45] BDO NAME _____

DISTRIBUTION - FOREST HEAD QUARTER.

Appendix IV

Government of Saskatchewan

Airtanker Evaluation Report

Fire Name: _____ **Fire Number:** _____ **District:** _____

Map Location: Base Map _____ Block _____ Grid _____ **Date:** _____

Times:
- Tanker request by _____
- time _____
- Birddog off _____
- 1st Tanker off _____
- First drop _____
- Last drop _____
- Ground crew arrival _____
- No. of ground crew _____

Fire Size:
- Arrival of birddog _____
- Arrival of tanker _____
- After action _____

Type of Mission:
- Initial attack _____
- Support action _____

Tanker Stand-By Status:
- Red _____
- Yellow _____
- Blue _____

Originating Tanker Base _____ Heading _____ Distance _____

Reloading Tanker Base _____ Heading _____ Distance _____

Diversion to: Base Map _____ Block _____ Grid _____

Fire name & number _____

Requested by & time _____

Fuel Type: _____ **Topography:** Level _____ Rolling _____ Step _____

ISI _____ BUI _____ FWI _____ Windspeed/direction _____

Retardant Type: LC _____ water _____

Viscosity _____ Salt content _____

Fire Behavior:

before	after
_____	smoldering _____
_____	running _____
_____	torching _____
_____	spotting _____
_____	crowning _____

Mission Success:

Good ___ Fair ___ Poor ___

Cause if unsuccessful

weather _____

mechanical _____

fire uncontrolable _____

other (specify) _____

_____

Other Aircraft Present: _____

_____

_____

_____

CANSO (no. & drops)

_____

_____

_____

Costs:

A/C	Hrs	Rate	Sub-total	Retardant gal	Retardant cost
Total					

Total Airtanker costs: _____

Drop Details:

Tanker	Drop time	Direct attack: flank	Direct attack: spot	Direct attack: head	Direct attack: rear	Indirect attack: flank	Indirect attack: spot	Indirect attack: head	Indirect attack: rear	Drop: into wind	Drop: cross wind	Drop: down wind	Drop type: single	Drop type: para	Drop type: salvo	Drop type: short trail	Drop type: long trail	Target: on	Target: off	Remarks

Comments:

Map:

N

Birddog Officer: _____

Appendix VA

SECTION a

GALLONS DROPPED AND AIR ATTACK COST

Aircraft Type							
Aircraft Registration							
No. of Loads							
Total Gallons							
Aircraft Time							
Aircraft Rate/Hour							
Aircraft Cost							

SECTION b

CONTROL TIMES

Initial Support

Getaway: _____ Attack Time: _____ _____
(From Tanker Base or other Fire No.)

Air Attack Officer: _____

Training (use code): _____

Fuel Burning At Attack: _____

Attack Size: _____

Rate of Spread (code): _____

Attack Location (code): _____

Initial Action Headquarters: _____

Signature: _____

Appendix VII

AIR ATTACK OPERATIONS LOG

GENERAL

Date: _____
District & Fire No.: _____
Getaway: _____
Basemap: _____
Altimeter: _____
Block: _____
Radio freq. – VHF: _____
Bearing: _____
– FM: _____
District: _____

GIVE FIRE CENTRE & ATTACK BASE

Time Off: _____
Bird dog No(s).: _____
Tanker No(s).: _____
ETA Fire: _____

OBTAIN FROM ATTACK BASE ENROUTE

Fire Boss: _____
Fire F.M. frequency: _____
Mode of Travel: _____
Crew ETA Fire: _____

GIVE REGION FIRE CENTRE *OVER THE FIRE* *ATTACK BASE*

Time On: _____
Attack Time: _____
Fire Size: _____
Fire Detection or Situation Report
Candidate Fire: Yes _____ No _____
if required: _____
Priority for Air Attack: _____
Low _____ Mod _____ High _____
Bombing duration (EST): _____
(min)

AIRCRAFT ON THE FIRE

Type	Call Sign	Frequency	Type	Call Sign	Frequency

WHEN BOMBING ACTION IS COMPLETE (OR FUEL REQUIRED)

Give Attack Base and Fire Centre

Time Off Fire: _____
ETA Tanker Base: _____

GENERAL COMMENTS

Air Attack Leader

Appendix VI

SOCIÉTÉ DE CONSERVATION DE L'OUTAOUAIS

JOURNAL DES ACTIVITÉS

DATE _____

AVIONS-CITERNES

IDENT. CIT.	N° FEU	QUADRILLAGE	SUR LE FEU				RÉSERVOIR		DE LA BASE		
			ATTA.	DÉP.	TEMPS	LARG.	PLEIN	VIDE	DÉP.	RETOUR	TOTAL

AVION D'AÉROPOINTAGE

IDENT.	N° FEU	N° PATL	QUADRILLAGE	SUR FEU		DE LA BASE			REMARQUES
				ARR.	DÉP.	DÉP.	RET.	TOTAL	

CL-215	CANSO:	MINUTES		%
TUU = 21	PQF = 11	01 - 05	=	0,08
TUV = 22	PQK = 12	06 - 10	=	0,17
TUW = 23	PQL = 13	11 - 15	=	0,25
TXA = 24	PQM = 14	16 - 20	=	0,33
TXB = 25	PQO = 15	21 - 25	=	0,42
TXC = 26	PQP = 16	26 - 30	=	0,50
TXE = 27		31 - 35	=	0,58
TXG = 28		36 - 40	=	0,67
TXI = 29		41 - 45	=	0,75
TXJ = 30		46 - 50	=	0,83
TXK = 31		51 - 55	=	0,92
YWO = 32		56 - 60	=	1,00
YWP = 33				
YWQ = 34				
YXG = 35				

OBSERVATIONS: _____

_____

_____

_____

_____

_____

_____

AÉROPOINTEUR: _____

Appendix VII

GRID: _____ REGION: _____ DATE: _____

DUNPHY TO FIRE: _____ ° _____ MI. TIME CHECK: TWG _____

B/D _____

FIRE TO A/S: _____ ° _____ MI.

A/S TO FIRE: _____ ° _____ MI. TANKER ROT.: _____

DUNPHY TO A/S: _____ ° _____ MI. SATELLITE BASE: _____

FIRE NAME: _____

BIRD DOG OFF